

Coastal Zone
Information
Center

08196

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-254 361

INFORMATION TECHNOLOGY AND URBAN MANAGEMENT
IN THE UNITED STATES

CALIFORNIA UNIVERSITY

PREPARED FOR
NATIONAL SCIENCE FOUNDATION

MARCH 1976

COASTAL ZONE
INFORMATION CENTER

HC
79
.I55
K73
1976

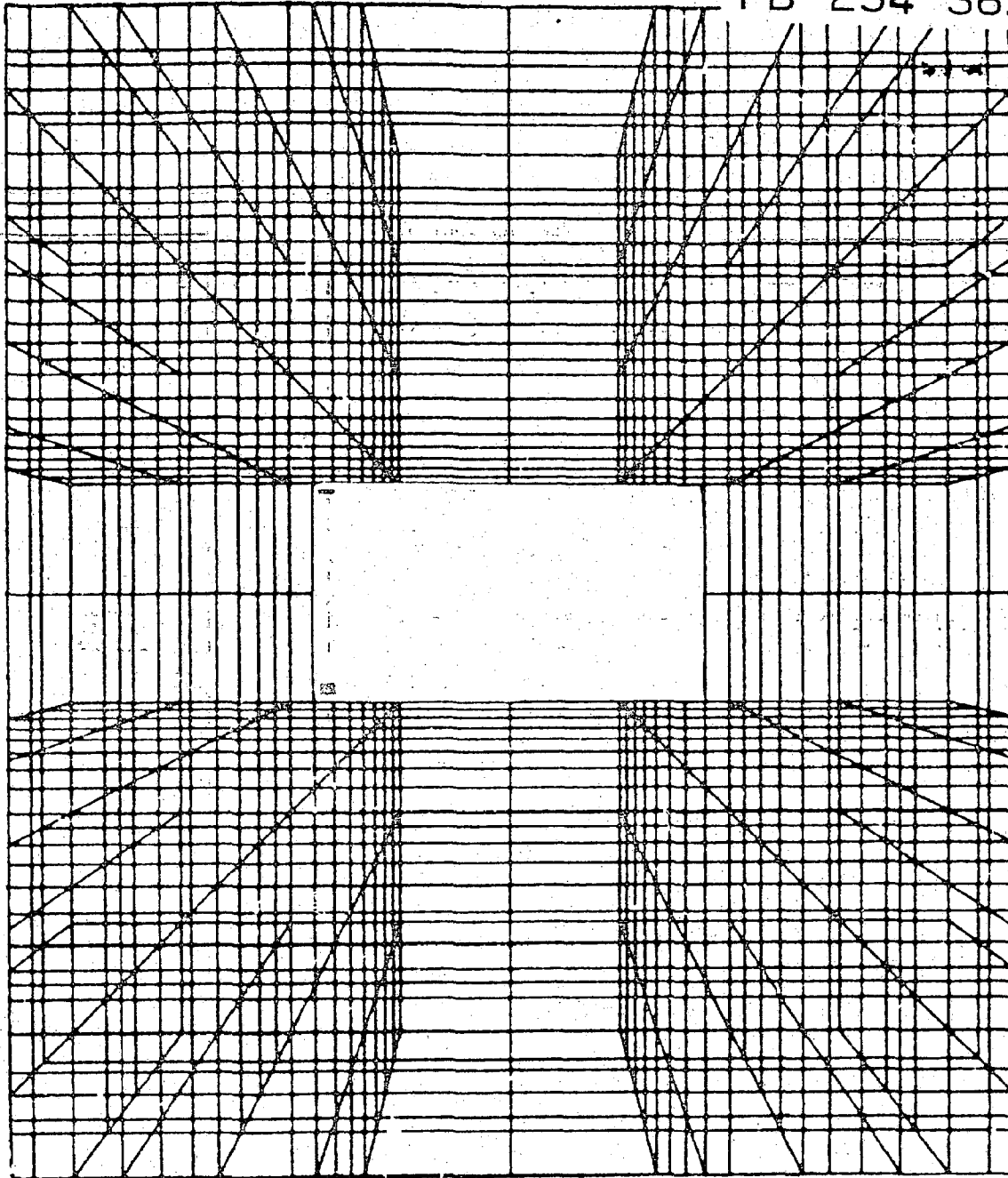
National Science Foundation / R.A.N.N.

HC 79. ISS K73 1976

191088

NSF/RA-760111

PB 254 361



REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161



Public Policy Research Organization
University of California, Irvine

RANN DOCUMENT CENTER
NATIONAL SCIENCE FOUNDATION

BIBLIOGRAPHIC DATA SHEET	1. Report No. NSE/RA-760111	2.	3. Recipient's Accession No.
4. Title and Subtitle Information Technology and Urban Management in the United States		5. Report Date March 1976	
		6.	
7. Author(s) K.L. Kraemer, J.N. Danziger, J.L. King		8. Performing Organization Rept. No. WP-76-14	
9. Performing Organization Name and Address University of California Public Policy Research Organization Urban Information Systems Research Group (URBIS) Irvine, CA 92717		10. Project/Task/Work Unit No.	
		11. Contract/Grant No. APR7412158 A01 & A02	
12. Sponsoring Organization Name and Address Research Applied to National Needs (RANN) National Science Foundation Washington, D.C. 20550		13. Type of Report & Period Covered	
		14.	
15. Supplementary Notes This paper is part of a research project entitled "Evaluation of Information Technology in Local Government," also known as URBIS Project			
16. Abstracts This paper presents a perspective on information technology and urban management in the U.S. covering topics in the provisional outline for the Organization for Economic Cooperation and Development (OECD) Panel report. Two major studies of the use and impact of computers in local government have been undertaken. The first is the study conducted by the Panel on Information Technology and Urban Management of the OECD whose work utilized comparative case studies of local government data processing in nine of the member nations. The second of these studies, the URBIS (Urban Information Systems) Research Project includes a large census survey of general purpose local government in all U.S. cities over 50,000 and counties over 100,000 population concerning electronic data processing (EDP). The survey indicated that virtually all of the larger city and county governments in the United States now use computers.			
17. Key Words and Document Analysis. 17a. Descriptors Information Systems Local Government Electronic Data Processing Computers Management			
17b. Identifiers/Open-Ended Terms Urban Information Systems (URBIS)			
17c. COSATI Field Group			
18. Availability Statement NTIS		19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 72
		20. Security Class (This Page) UNCLASSIFIED	22. Price \$4.50

PRICES SUBJECT TO CHANGE

08196

INFORMATION TECHNOLOGY
AND URBAN MANAGEMENT
IN THE UNITED STATES

by

Kenneth L. Kraemer
James N. Danziger
John Leslie King

WP-76-14

March, 1976

The Urban Information Systems Research Group (URBIS)
PUBLIC POLICY RESEARCH ORGANIZATION
University of California
Irvine, California 92717

714 / 833-5449

All rights reserved. No part of this volume may be produced
in any form without the specific written permission of PPRO.

Reproduction in whole or in part permitted for any purpose of the
United States Government. This provision is the only exception
of the copyright prohibition.

This paper is part of a research project entitled "Evaluation of Information Technology in Local Government," also known as the URBIS Project. This research is supported by a grant from the Advanced Productivity Research and Technology Division of the Directorate for Research Applications, the National Science Foundation (APR74-12158, A01 & A02).

The views expressed herein are those of the researchers and should not be ascribed as views of the National Science Foundation.

Through the U.S. State Department, this paper was made available to:

The Panel on Information Technology
and Urban Management of the
Computer Utilization Group
Committee for Science Policy
Organization for Economic Cooperation and Development
Paris, France

OUTLINE

INTRODUCTION

A GENERAL PROFILE OF COMPUTER UTILIZATION IN U.S. LOCAL GOVERNMENTS

Overview

Political, Economic, and Population Profile of Communities Using EDP

Current use of EDP

Political and socioeconomic characteristics of users

Patterns of EDP adoption in local governments

Administrative Profile of EDP Use

Organizational arrangements for EDP

Trends in EDP organization and management

The State of Information Technology

EDP resources

Investment

Computer capacity

EDP staff size

EDP applications

THE IMPACT OF INFORMATION TECHNOLOGY ON LOCAL ADMINISTRATION

Overview

Impacts on Service Delivery

Impacts on Management of Local Governments

Integration of governmental functions

Supervisor/staff relationships

Management decision making and control

Impacts on Planning Local Futures

CRITICAL ISSUES AND SOLUTIONS TO PROBLEMS

Issues of Privacy and Security

Issues of Computers and Societal Problems

Issues of EDP and the Structure and Function of Local Government

STEPS LOCAL GOVERNMENTS CAN TAKE TO MANAGE INFORMATION TECHNOLOGY

Introducing and Developing Information Technology Capability

Analyzing Costs and Benefits

Managing the Technology

Sharing the Technology

THE FEDERAL GOVERNMENT ROLE IN LOCAL GOVERNMENT INFORMATION TECHNOLOGY

General Perspective

General Interest in Local Information Technology

Federal Policy

Multiple Approaches to Municipal Assistance

Impacts of Federal Assistance

Suggestions about the Federal Role

CONCLUSION

NOTES

LIST OF TABLES

Table 1	U.S. Cities and Counties Using EDP
Table 2	Percentage of U.S. Cities and Counties Using Various Arrangements for Data Processing Services, by Population
Table 3	Percent of U.S. Cities and Counties Now Making or Planning a Change in EDP Arrangements
Table 4	U.S. City and County Data Processing Expenditures, 1975, by Population
Table 5	Selected Computing Equipment Characteristics for U.S. Cities and Counties, by Population
Table 6	EDP Personnel in U.S. Cities and Counties, by Population
Table 7	U.S. City and County Chief Executives' Beliefs About the Service Delivery Impacts of Computers and Data Processing
Table 8	U.S. City and County Chief Executives' Beliefs About the Impacts of Computers on Integration of Governmental Functions
Table 9	U.S. City and County Chief Executives' Beliefs About the Impact of Computers on the Supervision of Subordinates
Table 10	U.S. City and County Chief Executives' Beliefs About Information Available for Decision Making
Table 11	U.S. City and County Chief Executives' Beliefs About the Greatest Value of Computers and Data Processing to Local Government
Table 12	U.S. City and County Chief Executives' Beliefs About the Privacy and Confidentiality of Personal Records on Citizens
Table 13	U.S. Cities and Counties, Actual and Planned Transfer of Applications

LIST OF FIGURES

Figure 1 Cumulative Percentage of U.S. Cities and Counties Utilizing Computers, by Year of Adoption and Population, N = 485 Cities and 412 Counties

Figure 2 Percent of Total Operational Computer Applications in U.S. Cities over 50,000 and Counties over 100,000, by Type of Information Processing Task

INFORMATION TECHNOLOGY AND URBAN MANAGEMENT IN THE UNITED STATES*

INTRODUCTION

Urban areas throughout the world are facing increasingly serious and complex problems. Among these problems are deterioration of inner cities, fiscal crises, increasing incidence of poverty and crime, transportation inadequacies, and air and water pollution. These problems are taxing the operational and planning capabilities of urban government to the limit. In recent years, there has been hope that the application of information technology,¹ particularly computers, to urban management would provide assistance towards solving these problems by improving the operations of government agencies and by providing improved data for management and planning. Indeed, the use of computers in urban administration has grown steadily since their introduction in the 1950's. Today, a large majority of local governments and authorities in many developed countries now use computers.²

Despite this rapid growth in the utilization of electronic data processing (EDP) by local governments, extensive study of the impacts and outcomes of this technology has begun only recently. The lack of study has resulted in several interrelated problems. First, there has been little clear evidence that application of the technology has brought desired benefits. Second, there has been insufficient understanding of the causes behind "successes" and "failures" in achieving benefits from EDP use. Finally, there has been no way to develop a reliable set of recommendations for development and operation of EDP in order to help local governments avoid problems and to capitalize on the potential benefits of the technology.

In 1974, two major studies of the use and impact of computers on local governments were undertaken. The first is a study conducted by the Panel on

Information Technology and Urban Management of the Organization for Economic Cooperation and Development (OECD). The Panel's work utilizes comparative case studies of local government data processing in nine of the member nations.³ The second of these studies, the URBIS (Urban Information Systems) Research Project, is being conducted in the United States by the Public Policy Research Organization, University of California, Irvine, and is supported by a grant from the U. S. National Science Foundation. The URBIS Project's data base includes a large census survey of general purpose local governments in all U.S. cities over 50,000 and counties over 100,000 population, and additional in-depth case studies in forty selected U.S. cities.⁴ The project also utilizes data from a survey of smaller U.S. cities (10,000-50,000) and counties (10,000-100,000) conducted by the International City Management Association (ICMA). As part of the United States participation in the OECD Panel study, the URBIS Project is providing relevant information on computer usage in U.S. cities and counties.⁵

This paper presents a perspective on information technology and urban management in the U.S., covering topics in the provisional outline for the OECD Panel report. The views expressed in this paper are a synthesis of empirical research findings from the URBIS Project and other related projects assessing the use and impact of EDP in local government.⁶ Further discussion of the findings presented in this paper can be found in the references at the end.

A GENERAL PROFILE OF COMPUTER UTILIZATION IN U.S. LOCAL GOVERNMENTS

Overview

Electronic computers were first introduced into U.S. local governments in the 1950's. Since that time, their use and application has grown con-

tinuously. To characterize this development briefly, computers were first adopted by larger cities for handling routine operations, particularly in the finance function (e.g., billing, payroll). Since the finance unit usually was the greatest user, computing often was located in that department. As EDP applications have expanded into other local government functions, the computing operation has tended to move into an independent EDP department, and sometimes into operating departments. Currently, the mainstream of local government EDP usage remains in relatively straightforward information processing activities; but there are significant experiments with more sophisticated uses such as data banks, urban models, integrated municipal information systems and shared systems. 7-

Political, Economic, and Population Profile of Communities Using EDP

Current use of EDP⁸

The use of computers in U.S. local governments is quite pervasive (Table 1). About 51 percent of cities and 54 percent of counties over 10,000 in population currently use EDP. In general, use of EDP is related to the size of the local government, as measured by population (Table 1). The larger the local government, the greater the incidence of EDP use. For example, roughly one third of small cities or counties (population 10,000-25,000) use EDP; but nearly one hundred percent of the largest cities and counties (population greater than 250,000) use EDP.

[INSERT TABLE 1 ABOUT HERE]

Political and socioeconomic characteristics of users

EDP has so extensively penetrated local governments that it is difficult to generalize about the unique political and socioeconomic characteristics

Table 1 U.S. CITIES AND COUNTIES USING EDP

Classification	No. of governments ^a		Governments using EDP	
	(A)	No.	% of A	
Total, all cities	2,294	1,179	51%	
Population group				
500,000 and over	26	26	100	
250,000-499,999	31	31	100	
100,000-249,999	100	97	97	
50,000-99,999	246	227	92	
25,000-49,999	535	310	58	
10,000-24,999	1,356	488	36	
Total, all counties	2,221	1,191	54%	
Population group				
500,000 and over	58	56	96	
250,000-499,999	70	68	97	
100,000-249,999	182	164	89	
50,000-99,999	330	263	79	
25,000-49,999	568	297	52	
10,000-24,999	1,013	357	35	

^a The number of governments using computers among cities over 50,000 and counties over 100,000 is precise. For those smaller cities and counties, the number of governments using computers are estimates. Utilization of EDP in these smaller governments may be higher than shown in the table due to a low response rate among these respondents.

of EDP users. It is possible, however, to characterize those local governments which have "more developed" EDP -- "more developed" EDP here means a higher level of investment in EDP, a faster rate of adoption, a greater number of automated applications, and more sophisticated applications.⁹

These local governments tend to be in environments with (1) larger populations, (2) lower industrial activity and (3) larger proportions of higher socioeconomic strata. In addition, these governments tend to reflect the structures and practices of a professional management orientation to government. But they have neither greater nor fewer financial resources than comparable governments that make less use of EDP.

Patterns of EDP adoption in local governments¹⁰

Adoption of EDP in local governments seems to fit an established pattern for diffusion of technical innovations (Figure 1). Growth has been continuous since introduction. The larger governments adopted the technology first, followed by governments in successively smaller population groups at lags of about 5 years. The "take-off" period for most large local governments appears to have been in the early 1960's, for medium size governments in the mid-1960's and for smaller governments in the early 1970's. The period of greatest overall growth has been since 1970. The larger governments have required about twenty years to fully adopt the technology; their adoption pattern approximates a logistic curve (Figure 1). While nearly all the largest governments have adopted EDP, the smaller governments should continue to adopt at a high rate.

[INSERT FIGURE 1 ABOUT HERE]

Undoubtedly, these adoption patterns are tied to major advancements in information technology. The first and second generation computers of the

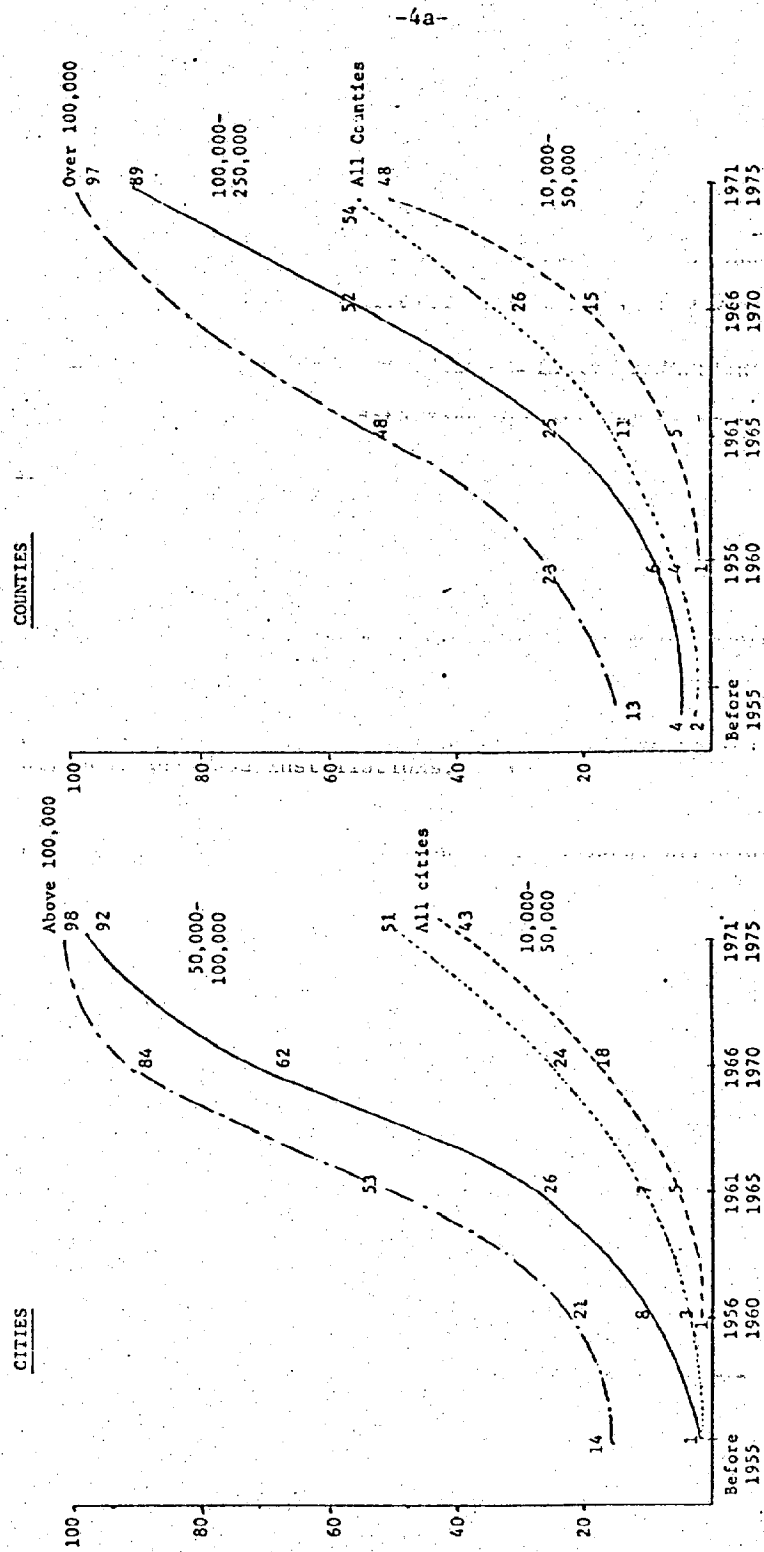


Figure 1 CUMULATIVE PERCENTAGE OF U.S. CITIES AND COUNTIES UTILIZING COMPUTERS, BY YEAR OF ADOPTION AND POPULATION, N = 485 CITIES AND 412 COUNTIES

late 1950's and early 1960's were characterized by expensive, large-scale, batch-processing systems. By the mid-1960's, the extensive time-sharing capabilities and the more sophisticated peripherals of the third generation machines were prevalent. Advancements during the late 1960's and early 1970's included a relative reduction in cost, more sophisticated software such as data base management, sophisticated communications and teleprocessing systems, and the introduction of smaller, less expensive minicomputers. As the capabilities of the technology continue to increase and the costs of hardware continue to decrease, it is likely that adoption will extend to even the smallest U.S. local governments.

Administrative Profile of EDP Use

Organizational arrangements for EDP¹¹

There are several arrangements whereby local governments obtain computing capability: in-house computer operations, outside service bureaus, private management of a government-owned facility, or sharing of a jointly-owned facility with other governments in a region.¹² Some governments use a combination of these arrangements, but two forms predominate, depending on the size of the local government.

Larger governments generally utilize a single, in-house, centralized installation (Table 2). Equipment is usually leased or rented rather than purchased. In most large governments, the computer operation is located in an independent EDP department; but in the very largest governments there might be multiple computer installations, each servicing several different user departments. In some cases, an individual user department will have its own computer. Applications tend to be developed in-house by analysts in either the EDP or user departments; however, other application

sources are also used, including consultants, computer manufacturers, software vendors, and other public agencies. To develop and expand staff capabilities for using EDP, these governments make use of varied training resources, including vendors, college courses, symposia, conferences, and special training seminars.

[INSERT TABLE 2 ABOUT HERE]

Smaller local governments, by contrast, make substantially greater use of outside EDP sources (Table 2). Usually these outside sources are service bureaus, although many governments utilize regional installations shared with other governments. Those smaller governments that perform in-house computing tend to have a single, centralized computer located in the finance or controller's department. In most of these in-house installations, the government purchases rather than rents or leases equipment. Applications tend to be designed by outside sources, primarily by manufacturers, consultants, and service bureaus. Only one-fourth of the smaller local governments develop applications in-house. They develop staff capabilities most often through visits to other data processing shops.

Trends in EDP organization and management¹³

Organization of EDP operations in local governments appears to be moving in opposite directions. One direction is toward greater management orientation; the other towards greater user orientation. While data processing activities often began as a part of the finance departments, over the last decade computer operations generally have been moving into a separate EDP department directly under the control of top management. However, the number of EDP installations in operating departments also has increased markedly during this time, indicating a counter-trend towards a more decentralized

Table 2 PERCENTAGE OF U.S. CITIES AND COUNTIES USING VARIOUS ARRANGEMENTS FOR DATA PROCESSING SERVICES, BY POPULATION^a

Classification	Total governments reporting (N)	Percent of governments with:			
		In-house data processing %	Facilities management organization %	Public regional installation %	Private service bureau %
Total, all cities	1,088	65	0	14	41
Population group					
500,000 and over	20	100	0	10	15
250,000-499,999	28	93	0	21	11
100,000-249,999	79	90	4	8	11
50,000- 99,999	178	75	0	12	24
25,000- 49,999	300	64	0	18	47
10,000- 24,999	483	54	0	13	51
Total, all counties	565	59	0	11	33
Population group					
500,000 and over	39	90	3	13	8
250,000-499,999	55	87	2	5	11
100,000-249,999	101	73	0	18	19
50,000- 99,999	129	49	0	15	36
25,000- 49,999	108	51	0	6	43
10,000- 24,999	133	44	0	8	48

^aTotal row percentages add to over 100% owing to multiple installations

facility located close to users. These developments have occurred in response to pressures from two directions. Pressure toward more management-oriented computing appears to come from managers who value direct control of EDP and from a desire among EDP professionals to move (out of finance) into a higher organizational position. Pressure for decentralized control of computing seems to come from users themselves, who demand a user-orientation--closer attention to their needs and priorities for EDP use in their functional areas.¹⁴

Use of policy boards to control use and development priorities of EDP resources appears to be one way of mediating multiple demands for EDP services. At present, these policy boards appear primarily in the larger governments and are most prevalent among the very largest governments. In addition to mediating multiple user demands, boards are used occasionally to deal with problems such as hardware procurement decisions and privacy concerns.¹⁵

EDP operations in the larger U.S. local governments are characterized by a surprising level of instability (Table 3).¹⁶ The greatest instability results from frequent changes in computer equipment. This includes changes in generation of machine, central processing unit core size, number of central processing units available, and mainframe vendor. These hardware and equipment changes generate other changes, including conversion of existing programs, staff retraining, and modification of data collection procedures.

[INSERT TABLE 3 ABOUT HERE]

Other important sources of instability are changes in data processing management and frequent changes in development priorities for new applications. Changes in development priorities also affect schedules for fur-

Table 3 PERCENT OF U.S. CITIES AND COUNTIES NOW MAKING OR PLANNING A CHANGE IN EDP ARRANGEMENTS

Percent of governments indicating a change:									
	CPU size	Development priorities	Generation of machine	EDP management	Physical location	Department status	Mainframe vendor	Installation relations	Number CPU's
<u>Cities</u>									
Change over last two years	57	42	40	31	21	22	17	12	10
Change planned over next two years	...	24	17	6	14	11	8	7	8
<u>Counties</u>									
Change over last two years	64	64	38	31	26	23	15	13	8
Change planned over next two years	...	25	18	4	23	13	4	11	7

Leaders (...) indicate not reported

ther applications in development. These changes are induced by the users who desire the new applications, by the technical staff implementing the applications, and by evolving state and federal legislation covering local functions. If the present pattern is a reliable predictor, it is likely that these instabilities will continue. Data processing managers seem to have an overly optimistic view of future changes, however, expecting overall changes about half as often as in the recent past, and one-sixth as often in the category of "change in EDP management" (Table 3).

The State of Information Technology

EDP resources¹⁷

Overall, EDP activity within U.S. local governments is not as great as one might expect from popular images created about information technology.

Although the proportion of local governments using EDP is high, the level of the EDP operation, when measured by level of investment, computer capacity and staff capability, varies considerably among local governments. Each measure of the EDP operation can be summarized briefly.

Investment. Local governments, on the average, spend about 1 percent of their total operating budgets on EDP (Table 4). Larger governments spend a larger proportion of their budget than smaller governments. For example, cities with populations of 10,000-25,000 average about .5 percent of their operating budgets on EDP expenditure, while cities with populations of 250,000-500,000 average about 1 percent (Table 4). Counties spend a larger share of the budget on EDP than do cities. This might be accounted for by the fact that county governments in the U.S. normally provide more large-scale services than do cities (such as voter registration lists, property tax assessment, welfare and health care) that are facilitated by automated ap-

plications. Also, the geographic spread of counties may make EDP attractive as a tool for integrating county functions.

[INSERT TABLE 4 ABOUT HERE]

These comparative figures are based on direct EDP expenditures. If EDP-related expenditures in user departments and in management were taken into account, the actual expenditure for EDP might average two or three percent. Even the higher percentage figure is not a very large percentage of a local government's budget, and certainly does not reflect the total cost of handling information in the local government.¹⁸ Generally, in the larger governments, about forty percent of the expenditures for EDP relate to equipment (Table 4). This proportion of equipment costs to total EDP costs has been decreasing steadily in most data processing operations, including local governments.

Computer capacity. As expected, computing capacity is closely related to government size and level of investment in EDP. Larger local governments often have more than one large mainframe, have large core capacities in their machines, and utilize time-sharing extensively (Table 5). However, the greatest proportion of local governments usually have one mainframe with small or medium core capacity and batch computing. This limited capacity indicates that most governments cannot provide interactive data processing and probably cannot service more than a few departments in the local government with extensive applications.

[INSERT TABLE 5 ABOUT HERE]

EDP staff size. Personnel in the EDP department comprise, on the average, less than one percent of local government employment (Table 6). The size of EDP staff is directly related to government size; for example, counties 100,000-249,999 average 14 personnel while counties 500,000 and over

Table 4 U.S. CITY AND COUNTY DATA PROCESSING EXPENDITURES, 1975, BY POPULATION

CLASSIFICATION	Total governments reporting (N)	Average government operating budget in current fiscal year (in thousands)	Average budgeted expenditures for data processing installation(s) (in thousands)	Average expenditure as a % of total operating budget	Average computer hardware expenditure as a % of total EDP budget
Total, all cities	984	\$ 22,895	\$ 224	1.0%	38%
Population group ^a					
500,000 and over	20	334,870	3,094	.9	38
250,000-499,999	26	107,864	1,069	1.0	41
100,000-249,999	75	50,215	598	1.2	37
50,000- 99,999	174	24,205	197	.8	39
25,000- 49,999	266	10,648	66	.6	...
10,000- 24,999	423	5,243	28	.5	...
Total, all counties	378	\$ 36,587	\$ 487	1.3%	37%
Population group					
500,000 and over	39	195,386	2,708	1.4	34
250,000-499,999	52	48,309	811	1.7	45
100,000-249,999	91	22,641	292	1.3	34
50,000- 99,999	75	11,517	76	.6	...
25,000- 49,999	58	9,205	42	.5	...
10,000- 24,999	63	3,868	25	.6	...

^a These figures are probably underestimates due to incomplete responses from some of the multiple installations in these cities.

Table 5 SELECTED COMPUTING EQUIPMENT CHARACTERISTICS FOR U.S. CITIES AND COUNTIES, BY POPULATION

Classification	No. of governments reporting	Average number of CPU's	Average total core capacity in bytes	Median total core capacity	Average number of CRT terminals
Total, all cities	647	1.2	165K	94K	8
Population group					
500,000 and over	19	4.0	1962	1536	71
250,000-499,999	25	2.1	554	328	19
100,000-249,999	76	1.5	217	144	6
50,000-99,999	169	1.2	71	32	1
25,000-49,999	174	1.1	54	22	...
10,000-24,999	184	1.0	27	16	...
Total, all counties	277	1.4	338K	160K	14
Population group					
500,000 and over	39	2.5	1494	676	37
250,000-499,999	50	1.5	312	196	15
100,000-249,999	97	1.3	155	64	4
50,000-99,999	47	1.1	57	24	...
25,000-49,999	32	1.0	48	24	...
10,000-24,999	12	1.0	36	16	...

Leaders (...) indicate not reported

average 96 personnel. Regardless of size, however, approximately one-fourth of the total EDP staff are analysts and programmers. The EDP staff in the user department is smaller in size than that in the EDP department, although probably not as small as Table 6 indicates.

[INSERT TABLE 6 ABOUT HERE]

EDP applications¹⁹

The majority of EDP applications involve automation of routine tasks (Figure 2). About three-fourths of all automated applications in local governments are used for recordkeeping and calculating/printing tasks, while the remaining applications are spread over the more sophisticated tasks involving record searching, record restructuring, sophisticated analysis, and process control.²⁰

[INSERT FIGURE 2 ABOUT HERE]

The most common automated tasks are in the area of accounting and financial control. These include treasury collections, accounting, assessment, and utility billing. The next most common areas of application are law enforcement (police and sheriff), courts, and budget and management.²¹ Since the areas most commonly developed are also the most extensively developed in terms of the number of applications operating within given tasks, it is fair to say that EDP in U.S. local governments is used primarily to facilitate administrative and social control activities. This suggests that EDP primarily serves the local government in the performance of internal bureau-

Table 6 EDP PERSONNEL IN U.S. CITIES AND COUNTIES, BY POPULATION

Classification	EDP departments			User departments		
	Total number personnel (A)	Percentage analysts and programmers (% of A)	Personnel as a % of total government employees	Total number EDP staff ^a (B)	Percentage analysts and programmers ^a (% of B)	
<u>Cities</u>						
Mean, all cities	22.0	24%	1.0	5.9	36%	
Population group						
500,000 and over	112.5	24	.8	30.1	45	
250,000-499,999	39.2	30	.9	11.2	25	
100,000-249,999	19.6	29	1.0	5.7	32	
50,000-99,999	7.6	21	1.1	1.2	25	
<u>Counties</u>						
Mean, all counties	37.8	26%	.3	10.2	27%	
Population group						
500,000 and over	95.6	27	.3	26.3	19	
250,000-499,999	29.6	34	.3	9.1	41	
100,000-249,999	14.3	23	.4	3.4	35	
Mean, all cities and counties	28.0	25%	.7	7.6	30%	

^a These figures are low estimates due to incomplete responses.

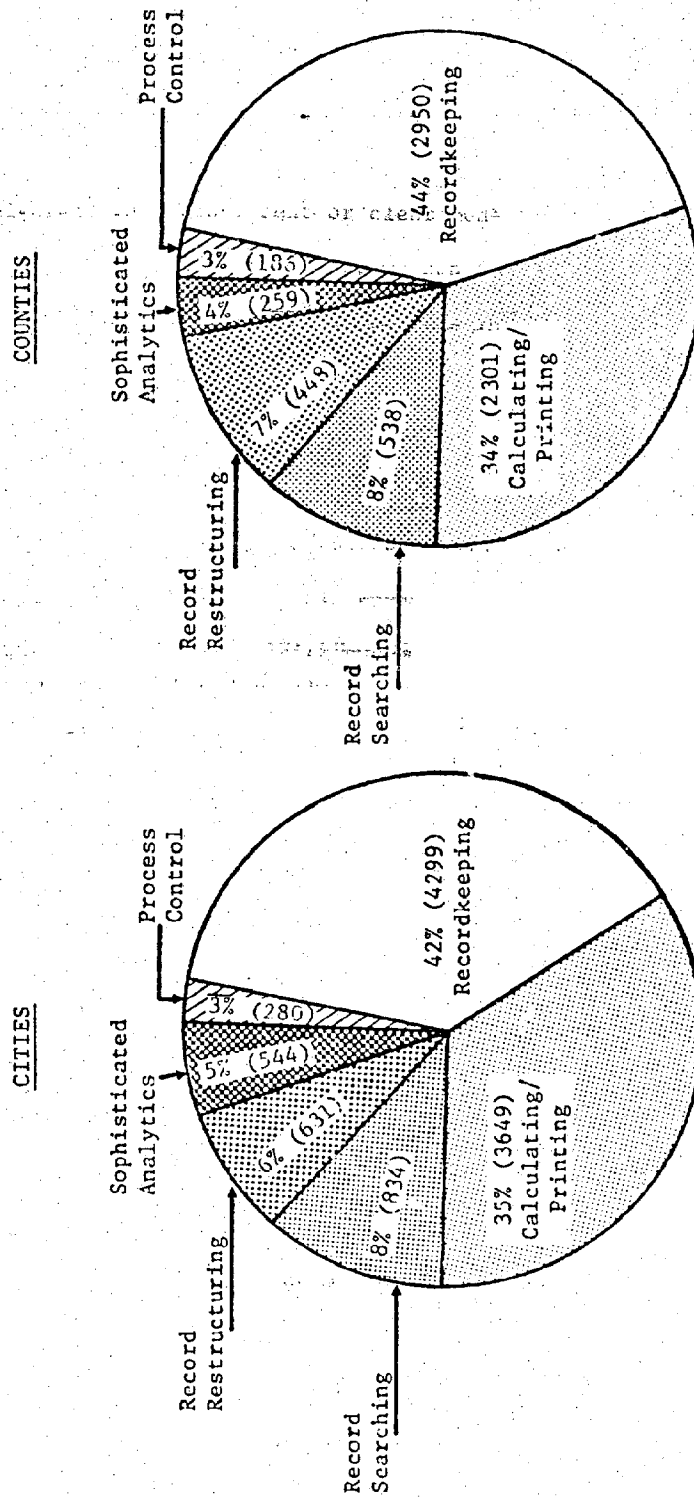


Figure 2 PERCENT OF TOTAL OPERATIONAL COMPUTER APPLICATIONS IN U.S. CITIES OVER 50,000 AND COUNTIES OVER 100,000, BY TYPE OF INFORMATION PROCESSING TASK

cratic tasks. Very few applications that enhance direct delivery of services to citizens such as social service information and referral or citizens complaint processing, are reported.²²

Over the next two years, growth of EDP applications will continue along present lines, primarily in the areas of finance and law enforcement. Assistance to management and resource planning also is an emerging area of growth. Applications commonly scheduled for development here include revenue and expenditure forecasting, cash control, expenditure monitoring, service and facility planning, and manpower allocation.²³ This growth probably will take two forms: development of new applications specifically for management and planning assistance, and inventive use of data in existing applications to provide information which serves management and planning needs.

THE IMPACT OF INFORMATION TECHNOLOGY ON LOCAL ADMINISTRATION

Overview

As indicated above, EDP in U.S. local governments primarily helps local government bureaucracies perform internal operations. To this point, there are very few computer-based applications that provide direct information or service to citizens.²⁴ With the exception of a few applications (e.g., computerized stolen property files that help law enforcement agencies return stolen property to rightful owners), the most direct contact most citizens have with local government computing is through the mail (e.g., utility and tax bills). Given this minimal impact of automation on direct service delivery to citizens, the question of impacts must be considered in another light: has EDP provided more timely, useful, comprehensive, and accurate information to local government employees and thereby enhanced their ability

to make good decisions, maintain efficient operations, and deliver government services?

The answer to this question is complicated. Often the activities of government fluctuate, so it is difficult to obtain consistent or clear measures of improvements in the value of those activities.²⁵ Still, we can begin to answer this question by considering the judgments of chief executives in city and county governments.²⁶ Although the chief executives offer only one evaluation of EDP impacts on local government, their perspective is the most comprehensive of all local government personnel.

In the following pages, we discuss chief executives' evaluation of EDP impacts on service delivery, local government management, and planning for local futures. These findings are based on questionnaire responses from about 80 percent of the chief executives in U.S. cities over 50,000 in population and counties over 100,000 in population. We also integrate our appraisal, based on intensive field research, with the chief executives' views.

Impacts on Service Delivery

A common rationale for obtaining computers in the past has been the argument that EDP use enables a government to accomplish its functions with smaller staffs and lower costs.²⁷ According to chief executives, this beneficial impact has not materialized (Table 7). Fewer than one-third of the executives feel that computers have reduced staff for the operations to which they have been applied. Similarly, fewer than a third feel that computers have effected reductions in costs where applied. Yet, it is clear that EDP has facilitated reductions in some cases.²⁸ One obvious situation is where automation reduces the number of personnel needed to perform routine clerical tasks, such as calculating charges and printing bills. Also,

computers sometimes have allowed governments to avoid greater costs. For example, real property can be appraised at more frequent intervals and without hiring additional staff by using computerized regression analyses to estimate property values.

[INSERT TABLE 7 ABOUT HERE]

While there have been some staff/cost reductions and avoidance, this widely claimed benefit of computing has not been widely realized. Why not? The answer seems to lie in the problematic relationship between EDP use and a local government's overall cost and staff situation. Although the computer can eliminate the need for certain clerical personnel, automation itself creates a demand for technically-trained personnel both in the EDP function and user departments. Usually, the displacement of lower-paid clerks is offset by the need to hire higher-paid EDP technicians or user professionals. Moreover, clerks continue to be required for data entry. In fact, automation often stimulates the collection and entry of additional data, requiring even more data entry clerks. Also, it has been common for local governments to eliminate displaced personnel by natural turnover and retirement. In such cases, the impact of computerization is unclear, and there are additional short-run costs during the interim when both the EDP operation and the excess staff are maintained.²⁹

The most obvious and most favorable impacts of EDP on service delivery have been in the automation of three kinds of applications. The first involves applications that require the processing of very large complicated files, such as land parcel records for taxing purposes or customer utility accounts for billing purposes. The second involves applications that require the frequent search and updating of files, such as wanted persons

Table 7 U.S. CITY AND COUNTY CHIEF EXECUTIVES' BELIEFS ABOUT THE SERVICE DELIVERY IMPACTS OF COMPUTERS AND DATA PROCESSING

Question	Percentage indicating:				
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
"For the most part, computers have not reduced the cost of government operations where they have been applied." (N=563)	9%	42	17	28	3
"Computers usually enable a reduction in the staff necessary to perform a task." (N=564)	4%	28	25	39	5
"For the most part, computers have clearly increased the speed and ease of performance of government operations where they have been applied." (N=565)	23%	60	13	4	0
"In the future, the computer will become much more essential in the day-to-day operations of this government." (N=564)	56%	39	4	1	0

files or stolen vehicle files in law enforcement. The third involves applications where geographically dispersed locations need rapid access to centrally stored information, such as neighborhood health and social service centers that need immediate access to centralized client records. In these areas, computing probably has resulted in cost savings or cost avoidance, in improved information-handling in service delivery, in staffing efficiencies, or in all three.³⁰

Despite the ambiguity of service delivery benefits from EDP use, the chief executives clearly feel that the use of computers has been broadly beneficial to their governments. Eighty percent agree that computers have in some way increased the speed and ease of government operations where they have been applied. Ninety-five percent feel that computers will become more essential in the day-to-day operations of their government in the future.³¹

Impacts on Management of Local Governments

Impacts of EDP on the management of local government can be classified according to impacts on integration of governmental functions, the relationship between supervisors and staff personnel, and management decision making and control.

Integration of governmental functions

It has been postulated that EDP operations would tend to increase communication and coordination among the different departments in organizations.³² While the findings are not conclusive, about half of the chief executives feel that interdepartmental cooperation has improved since the introduction of EDP, whereas fewer than 15 percent feel it has not (Table 8). The large number of undecided executives indicates that changes in interdepartmental cooperation might be difficult to assess.

[INSERT TABLE 8 ABOUT HERE]

Table 8 U.S. CITY AND COUNTY CHIEF EXECUTIVES' BELIEFS ABOUT THE IMPACTS OF COMPUTERS ON INTEGRATION OF GOVERNMENTAL FUNCTIONS

Question	Percentage indicating:				
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
"The use of computers and data processing results in greater cooperation among the operating departments and agencies." (=564)	6%	43	37	14	1

Supervisor/staff relationships

Another common prediction about EDP's impact on organizations has been that it would alter the relationships between staff personnel and their supervisors, primarily by improving the ability of a supervisor to monitor subordinates.³³ Chief executives generally do not believe this has happened (Table 9). However, it would be premature to conclude that EDP has had no impact on supervisor/staff relationships solely on the basis of chief executives' opinions. It is likely that subordinates would be more sensitive to this issue than the top executive. Indeed, evidence from field work conducted for the URBIS project indicates that subordinates do feel they are being more closely supervised where their superiors have access to computer-generated workload statistics.³⁴

[INSERT TABLE 9 ABOUT HERE]

Management decision making and control

By far the most interesting predicted impact of EDP on organizations was that it would greatly improve management's capabilities for decision making and control by increasing the quantity, quality, and timeliness of useful information. The great majority of chief executives agree that EDP generally has increased the amount of helpful information available for management decision; yet their greatest problem with EDP is their inability to get information on specific questions or problems (Table 10). Chief executives believe that much useful data is available in the government, but that data generally are not managed in ways that facilitate retrieval.

[INSERT TABLE 10 ABOUT HERE]

Those sites with more "management oriented computing" provide some insight into the management impacts. Management oriented computing here means

Table 9 U.S. CITY AND COUNTY CHIEF EXECUTIVES' BELIEFS ABOUT THE IMPACT OF COMPUTERS ON THE SUPERVISION OF SUBORDINATES

"Has the use of computers and data processing significantly altered the relationship between supervisors and staff in departments which use them?"	Percent indicating	N
No	70%	(338)
Yes, tended to give supervisors <u>more</u> control over staff	28%	(136)
Yes, tended to give supervisors <u>less</u> control over staff	2%	(10)
TOTAL	100%	(484)

Table 10 U.S. CITY AND COUNTY CHIEF EXECUTIVES' BELIEFS ABOUT INFORMATION AVAILABLE FOR DECISION MAKING

Question	Percentage indicating:				
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
"In general, computers provide information which is helpful to me in making decisions." (N=562)	28%	59	6	6	0
"The computer makes information available to department heads that was not available before." (N=562)	37%	54	5	4	0
*"Reports and other materials produced by the computer are too detailed for my use." (N=561)	2%	18	16	58	7
"Much of the data gathered by this government in its daily operations is not collected or organized in ways that provide useful information about community conditions and government operations." (N=561)	9%	47	15	26	3
"If properly designed and managed, much of the data gathered by this government in its daily operations could be collected and organized in ways that provide useful information about community conditions and government operations." (N=559)	28%	63	7	1	0

*Disagreement to this question indicates a positive view towards the impacts of computer.

that top management frequently receives computer information or reports based on such information.³⁵ Chief executives in these governments tend to perceive greater impacts from computers on decision making and control, and also on services delivery. Much of the improvement from automated information systems in these governments seems to result from the manager's increased capability to capitalize on the available decision data already existing in operational files. By use of aggregated information on government operations and by use of exception reporting systems, many managers feel they have been able to improve their control over the operational activities of certain departments, over the personnel assigned to different tasks, and over budgeting, expenditure and cash flow. One sign of the growing management importance of EDP is the trend to move EDP operations out of user departments and into independent departments under the direct control of top management.

Impacts on Planning Local Futures

Computers might provide assistance for three kinds of planning activities: modeling the dynamics of the urban environments, monitoring change in the environment, and estimating the effects of specific government interventions in the environment.

The construction of elaborate computer-based models, particularly simulations, for predicting future conditions and for evaluating urban development alternatives is appealing. This kind of computerized urban planning assistance is rare in the United States today, although much experimentation with urban models occurred in the sixties.³⁶ Three factors operate against successful implementation of such modeling as a useful tool in urban planning.³⁷ First, the models themselves frequently are complex, and

often involve many conceptual and methodological problems. In many cases, it is doubtful that they accurately represent urban conditions. Second, acquiring reliable and valid data for the large-scale simulation models is a costly task, and is usually beyond the scope of a local government's continuing data collection activities. Thus, many urban simulation models have been built, but few have been maintained and used. Finally, the successful execution of such a model, while useful to professional planners, would probably be of little overall impact in planning decisions. The planning process in most U.S. local governments is highly political and involves interactions among many competing interests. Thus, it is unlikely that the results of any model would be sufficiently compelling to override other considerations, but they could be one of many critical factors in decisions about comprehensive planning.

Currently, the monitoring of environmental change is a more promising kind of computerized planning assistance, and it is occurring in some U.S. local governments. In these applications, EDP can provide the analyst or planner with the ability to gather data on a number of relevant variables, to construct social indicators from these data, and to analyze likely futures. For example, such a system might be used to evaluate growth and decay patterns in order to identify areas of need in planning the location of future municipal service facilities.

The third kind of computerized planning assistance is the most common in local governments today. It involves the use of operational models to estimate the possible short-range effects of change. Applications of this kind are illustrated in routing roads and utility corridors, scheduling public transportation, examining the impact of alterations in local revenues and expenditures, and anticipating demands on municipal utilities such as

water and electricity.

Computerized planning applications, particularly the more modest ones, probably will increase as local governments continue to expand their use of EDP beyond routine applications. This shift to more sophisticated EDP use is reflected in the opinions of chief executives, many of whom feel the greatest future uses of EDP in local governments will be in the areas of analysis and forecasting³⁸ (Table 11).

[INSERT TABLE 11 ABOUT HERE]

CRITICAL ISSUES AND SOLUTIONS TO PROBLEMS

A number of important problems and issues relate to local government use of EDP. Our discussion of impacts has alluded to some of them, and all have been anticipated in the literature about information systems in local government. Three issues are: privacy and confidentiality of data; the use of computers to alleviate societal problems; and the long-range effects of EDP on the structure and function of local government.

Issues of Privacy and Security

One of the most widespread concerns about the use of EDP in government is the problem of personal privacy and the security of sensitive data. This concern exists in many countries and has resulted in the enactment of legislation designed to protect individuals from the misuse of personal information in government records. In the U.S., this topic has been the subject of several congressional inquiries, a presidential commission, numerous task forces within government agencies, and a growing number of federal, state, and local legislative efforts aimed at the protection of individual privacy. In all these, computerized records of personal data are cited as being particularly hazardous to privacy.³⁹

Table 11 U.S. CITY AND COUNTY CHIEF EXECUTIVES' BELIEFS ABOUT THE GREATEST VALUE OF COMPUTERS AND DATA PROCESSING TO LOCAL GOVERNMENT^a

The greatest value of computers to local government:	Percentage indicating of greatest value ^b	
	Currently	In future
CLERICAL, such as printing, recordkeeping, accounting	90%	47%
INFORMATION RETRIEVAL, such as searching criminal histories, property records, or customer accounts	72%	51%
POOLING large amounts of data for use by several departments or agencies	39%	37%
ANALYSIS, such as summarizing and aiding the interpretation of large amounts of data	45%	63%
FORECASTING, such as predicting community growth	9%	46%
COMPUTER-DECISION MAKING, using the computer to decide between alternative courses of action	5%	37%

^a Each executive was asked to indicate no more than three of the six uses which are currently of greatest value and no more than three uses where computing will be of greatest value in the future.

^b Note that percentages down each column add to over 100% because respondent could indicate up to three categories. (N=556)

In most governments the privacy issue is a topic of substantial interest (Table 12). Most chief executives support the right of an individuals to control the information kept on them and agree that privacy should be protected.⁴⁰ Few chief executives report complaints about invasion of privacy stemming from data in their local government's records. This might be due to the fact that most records of personal data currently held by U.S. local governments are neither sufficiently detailed nor integrated to pose a serious threat to privacy. In spite of the general concern for the issue of privacy, the little incidence of serious problems at the local level may explain why only 20 percent of local governments have ordinances relating to privacy and security of local government records.⁴¹

[INSERT TABLE 12 ABOUT HERE]

As more state and federal legislation requires local authorities to maintain the privacy of local records, it is likely that more local governments will adopt ordinances and regulations controlling personal data. Even though threats to privacy from abuses of personal data stored in local government records might be as unlikely as a serious flood or fire, it is important that local officials anticipate and prevent even a chance occurrence. The best way to prevent improper uses of data is to install control mechanisms in all aspects of local government data activity, including collection, storage, processing, and use.

Issues of Computers and Societal Problems

Many societal problems are particularly manifest in local areas. Local governments, either through their own initiative or as implementors of federal and state policy, are attempting to respond to these problems. The impacts of computers on solving societal problems generally occur indirectly through

Table 12 U.S. CITY AND COUNTY CHIEF EXECUTIVES' BELIEFS ABOUT PRIVACY AND CONFIDENTIALITY OF PERSONAL RECORDS ON CITIZENS

Question	Percentage indicating:				
	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
"Individual citizens have the right to control what information is kept on them, how that information is used by government officials, and how it is released." (N=561)	33%	40	17	9	1
"Local governments should establish guidelines and implement mechanisms for controlling the collection and dissemination of personal information on individual citizens." (N=564)	28%	36	19	11	6

enhancing the ability of local governments to take effective action. For example, to the extent that the fiscal crises facing many local governments are societal problems, the contribution of the computer to better financial management (e.g., budget, expenditure and cash control) and to greater efficiency and effectiveness is certainly an assistance. Similarly, to the extent that local governments are chosen to administer state or national social service programs, the contributions of the computer to improved coordination of service planning and delivery (e.g., automated information and referral) among fragmented and dispersed social service centers is an assistance.

Perhaps the most intriguing contribution computers can make to alleviate societal problems is in the area of planning. It has already been noted that the effective use of computers to model and simulate urban environments is rare; but the more practical planning uses of EDP offer more immediate problem-finding and problem-solving benefits. The critical need for U.S. planners is for better insights and understandings about the complex social phenomena that result in urban and other societal problems. To gain better insight, planners need more comprehensive data bases that assist in more reliable analysis of problems. But the need for better conceptual frameworks with which to analyze the data rests with people, not with the technology. The relationships between the social and environmental phenomena that create societal problems must be understood more clearly through more extensive and thorough urban research. Computers probably will have their strongest and most immediate impact as the servants of urban research designed to develop responses for societal problems.

Issues of EDP and the Structure and Function of Local Government

Local government managers must face certain important issues concerning

management of EDP if more effective use is to be made of this technology.⁴²

The first and perhaps most striking management issue is a breakdown of communication between the EDP department and the user departments. The misunderstandings between EDP and users can result in user dissatisfaction with the manner in which applications are designed and with the quality of EDP services delivered. Such communication problems obviously hinder effective use of the technology. Similarly, a failure of top management to control the development priorities and on-going operations of the EDP function can create problems. To the extent that chief executives are involved in EDP decisions, they tend to concentrate on equipment decisions.⁴³ This is understandable, given the cost and visibility of such decisions; but the issues of development priorities, communications, and operational effectiveness are equally important, if not more so.

Ineffective control on the part of both users and management helps insulate the EDP function from being accountable to either group. If EDP is uncontrolled, it is likely to become a "skill bureaucracy" within the local government: a self-serving organizational unit that takes advantage of its relative monopoly on technical expertise. Like other skill bureaucracies, the EDP unit may be driven by its own imperatives to maintain its autonomy and freedom from control, to expand its activities, and to dominate the user-client relationships.⁴⁴

These problems can be solved when management accentuates the service-provider role of EDP by controlling its operations and development. Managers should take an active role in priority-setting, and perhaps head a policy board to govern EDP use. EDP should be put on a specific multi-year development plan that emphasizes short-term goals. Demand for EDP services should be regulated by a sensitive mixed pricing mechanism. Users might be

given more control over EDP's response to their needs by making analysts or programmers directly responsible to them and perhaps by establishing service contracts with the EDP department.⁴⁵

STEPS LOCAL GOVERNMENTS CAN TAKE TO MANAGE INFORMATION TECHNOLOGY

Introducing and Developing Information Technology Capability

With such a high percentage of U.S. local governments now using computers, the question is no longer whether "to adopt or not adopt." Rather, the key questions concern the rate and nature of EDP development. This concern includes several key points: the speed at which EDP services are developed and expanded; the rate at which hardware and software are upgraded; the optimal size of data processing staff; and the level of user and management involvement in EDP development. The most concise advice that can be given about these issues is to learn as much as possible about the experiences of others, and to approach EDP development with common sense.

It is particularly important to understand the impact of instability on the development of EDP. We have noted major instabilities in many EDP operations over only two years. Some instability, because it is planned, can be counteracted. This includes upgrading computing equipment, efforts to take on new applications, and attempts to reorganize the EDP operation. However, many instabilities are not anticipated and disrupt both the EDP development sequence and also the on-going operation. These include sudden obsolescence of certain kinds of equipment, turnover in EDP management, loss of a vendor from the market, and communications and management difficulties with EDP.

Local government administrators should realize these instabilities can turn EDP the problem solver into a *problem-generator*.⁴⁶ The key to success-

ful development is the realization that computers demand continual management attention. There are costs as well as benefits associated with EDP, and in many cases it will not be easy to assess accurately the true benefits of EDP relative to operational costs. Computers place a burden on government management because they cause a stream of changes in the government organization that must be dealt with. In fact, the more extensively EDP is developed in the organization, the more it will disrupt and alter traditional operating procedures and behaviors.⁴⁷

Analyzing Costs and Benefits

Local government operations always have been difficult to evaluate in terms of costs and benefits because they generate public goods to which no "market price" can be attached. In many ways, cost-benefit analysis of EDP operations shares this problem. Analysis of routine computer operations can be relatively easy, provided that the costs and outcomes of operations without EDP can be compared with equivalent automated operations. As long as the level of production or quality of service have not changed under the EDP operation, this kind of analysis is useful. However, truly parallel conditions are rare, and as computers are applied to more complex applications, the difficulty of cost-benefit analysis becomes even greater.

There are two major difficulties. The most obvious is that of placing a monetary (or any quantifiable) value on such outcomes as "improved police protection" or "more accurate government records." The second difficulty involves the accurate accounting of costs in complex, time-shared computer systems. Since different kinds of applications require different quantities and qualities of computer capability, it is necessary to accurately attribute the costs for these different demands among applications. Even if

staff costs could be estimated accurately, it is very difficult to assess costs associated with a "lumpy" resource like computing capacity. This blurring of evaluative criteria makes cost-benefit analysis very difficult to perform and of questionable value as a decision tool. Yet, it is necessary to apply some reasonable cost-benefit calculus to decisions about EDP. Managers must remember that even when analysis is performed carefully, estimates are still rough and slippery.⁴⁸

Managing the Technology

As the discussion of cost-benefit difficulties indicates, local government managers must confront hard questions when considering EDP development and operation. In many cases, the question of "what should be done next?" must be countered with "should anything be done next?" At the very least, it is important to consider a range of alternative approaches. In some cases, local governments will find that they can realize the improvements and savings they seek through a less complex mode of automation than has been proposed. Sometimes it might be appropriate simply to modify a current operation rather than to computerize it. For example, instead of installing a computerized system to mail out the monthly water bills, it might be more sensible to switch to bi-monthly billing using the present manual method.

In addition to asking hard questions about EDP development and operation, managers must take a more active, leading role in EDP policy matters. EDP must be directed within the organization or it will direct itself. This does not mean that managers should necessarily centralize EDP operations or force departments to support a single EDP department. Rather, it means that local government managers should oversee EDP development and operations to insure that each adoption and expansion of the technology serves their defi-

nition of government objectives. Some of the techniques for achieving this control have been suggested above.

Sharing the Technology

A final point related to management's EDP role regards the sharing of EDP technology. In recent years there has been considerable promotional discussion about the sharing of information technology advancements among local governments. Central to this discussion is the concept of "transfer," meaning inter-governmental transfer of EDP applications. The rationale behind the transfer argument is that by sharing applications with one another, local governments can capitalize on each other's developments and avoid unnecessary costs incurred from "reinventing the wheel." Despite the intuitive appeal of this concept, transfer should receive critical consideration by local government managers.

The extent of computer applications transfer among U.S. local governments is very low.⁴⁹ Only 22 percent of the local governments have transferred applications within the last two years, and only 23 percent plan to do so in the next two years (Table 13). Of the transfers that do occur, most involve simple, stand-alone applications that serve routine operational or middle management tasks such as payroll printing or report preparation. The hope that sophisticated EDP application packages would be broadly disseminated by transfer generally has not materialized.

[INSERT TABLE 13 ABOUT HERE]

Why hasn't applications transfer flourished? The transfer concept makes good intuitive sense, but it does not address certain realities of local government EDP situations. There are two kinds of problems with transfer.⁵⁰ The first is the naive assumption that transfer is an easy process and always

Table 13 U.S. CITIES AND COUNTIES, ACTUAL AND PLANNED TRANSFER OF APPLICATIONS

	Have transferred	Plan to transfer
<u>Cities</u>		
Percent of governments	18%	22%
Average number of applications	1.4	1.5
<u>Counties</u>		
Percent of governments	29%	25%
Average number of applications	1.6	1.9
<u>Total, all cities and counties</u>		
Percent of governments	22%	23%
Average number of applications	1.5	1.7

^a During the last two years.

^b During the next two years.

saves money. In fact, transfers often face many difficulties in which cost may exceed development savings. Since most applications are developed to meet the specific needs and characteristics of one local jurisdiction, they often do not fit the needs of other governments. There may be serious differences in technical (hardware or software) compatibility; the application may have been developed to fit a different set of government operating procedures; it may be hard to integrate the new applications into the EDP activities of the new site; documentation may be insufficient. Finally, the local EDP staff simply may be unenthusiastic about transferring-in something they think they could better develop. The second problem with transfer is that of underestimating the long-range value of in-house development, despite its higher initial costs. In-house development can have two particular benefits.

First, the application is tailored to the needs and characteristics of the local government. Second, the competence of staff for effective maintenance and improvement of the application is developed along with the application.

Thus, the point for local managers is simple: do not be easily sold on the transfer concept without first considering the problems with transfer and the possible benefits of in-house development. This advice appears quite relevant. While the current level of transfer among local governments is low (Table 14), most chief executives prefer to obtain computer applications by transfer from another government (52 percent) or from a private vendor (14 percent) rather than developing computer applications in-house (34 percent).⁵¹ This preference of the chief executives suggests top management support and pressure for future transfers.

It may be that the greatest value in the transfer concept is the possibility for greater sharing of approaches to EDP problems and of concepts for

automating tasks. This kind of sharing facilitates learning from the mistakes as well as successes of others, and can work to improve mutual understanding of other aspects of municipal operations among governments as well. There might be a time when direct intergovernmental transfer of computer applications is sensible and common practice; but the current emphasis of transfer should be on sharing experiences and approaches.

THE FEDERAL GOVERNMENT ROLE IN LOCAL GOVERNMENT INFORMATION TECHNOLOGY

General Perspective

This paper has thus far concentrated on the experience of the U.S. local governments with EDP. This section will explore the role of the U.S. federal government in the evolution and development of information technology in local governments.

Before proceeding to a discussion of specific federal efforts, it is helpful to consider the federal government's relation to local governments. The governmental structure of the United States is highly decentralized, relative to most OECD member nations. Constitutionally, local governments are the creatures of state governments in the U.S. federal system. In practice, however, substantial autonomy has devolved to city and county government. Within extremely broad constraints, local governments establish their own organizational and operating arrangements and determine the nature and level of public service provision. In recent decades the federal (central) government has been increasingly involved in direct relationships with local governments. To this point, the role of the federal government in local affairs is usually limited to categorical grants and entitlements for specific programs. These programs are often of limited duration, and frequently are

carried out in only a portion of U.S. local governments. This has been the case regarding federal assistance for local government efforts with information technology.

On the whole, local governments have adopted and developed information technology on their own. The federal influence on local government EDP has been secondary and piecemeal. The federal government involvement generally has been concentrated in specific projects and programs through grants-in-aid from mission agencies and departments such as Health, Education and Welfare (HEW), Housing and Urban Development (HUD), Labor, Commerce, Transportation and Justice. Since each of these agencies performs a different role in the government, their interests in helping local governments differ. In most cases, assistance to local government EDP has followed the mission interest of whatever agency was funding the project or program.⁵²

Federal Interest in Local Information Technology

Federal interest in EDP at the local government level originally was a consequence of two general concerns. The first was a desire to help the young computer industry define its markets and develop its products. Local governments were included in studies of potential market demands for information technology conducted by the Department of Commerce, and were, in some cases, encouraged to look into computers as possible tools for urban management. The second interest was the possible employment impacts EDP might have on the national economy. In the late 1950's and early 1960's there was a concern that widespread computer automation would displace a large number of workers, creating problems of unemployment. Studies to assess these possible impacts of computers on local governments were conducted by the Depart-

ment of Labor and others.⁵³ Once it became clear that the computer industry was going to expand and that EDP would not bring mass unemployment, the federal government became a proponent of the technology's use.

Since the mid-1960's, federal government interests have moved toward a concern for using computers to improve management throughout the governmental system in the U.S. This concern has been heightened by four factors. The first was an increasing need by the federal government for detailed statistics about society for use in program planning.⁵⁴ At the local level, this need was driven by the advent of such Great Society programs as the "War on Poverty." The second factor was a need for data about the impacts of various federal programs in urban areas, particularly the Great Society programs.⁵⁵ Third, there was a desire to capitalize on the enormous investment the federal government had made in the U.S. space program (and in research and development generally) by attempting to transfer relevant technological developments into local governments.⁵⁶ Finally, some agencies, particularly those with programs in urban areas, perceived a need to assist the improvement of local government management, and they developed a joint program for that purpose.⁵⁷ These federal interests can be seen clearly in some projects and programs, while in others the interests are less easy to distinguish due to interagency cooperation on specific programs.

Federal Policy

These federal government interests all have been implemented through development of functionally-specific programs rather than through ongoing institutional support. Federal support has been largely financial, usually through grant-in-aid programs. In 1970 it was estimated that the federal government was providing approximately \$200 million annually toward development of EDP capability in local governments.⁵⁸ Along with this financial

assistance, the federal government has provided technical assistance through promotion of transfer, demonstration projects, and temporary exchanges of professional personnel among levels of government.

To date there has been no coordinated federal policy toward support of local government information technology. Most programs permit expenditure of funds only for development of computer applications, while some permit purchase of equipment. Given the absence of coordination among the various agencies involved in local government EDP programs, "federal policy" has usually been a sum of the varied and sometimes conflicting policies of relevant mission agencies.

Local Governments. Examples are the Multiple Approaches to Municipal Assistance

Analyzed as a whole, federal programs and projects to assist local governments in EDP activities have taken several forms. Each of these is outlined below:

1. *Demonstration Projects.* These are joint federal-local undertakings, usually supported with federal money, and designed to build prototypes of systems that, it is assumed, will be transferred to other sites. Examples of these projects are: the now defunct HUD Databanks at Tulsa, Oklahoma and Alexandria, Virginia; the USAC Program; and the HEW Information and Referral System projects.⁵⁹
2. *Construction of Intergovernmental Systems.* These are often networks designed to link together the data of federal, state and local agencies that perform similar tasks. The prime example of this approach is the National Crime In-

formation Center/Computerized Criminal History (NCIC/CCH) network supported by the Department of Justice.⁶⁰ Other such networks are under construction.

3. *Transfer Projects.* These include three kinds of transfer. The first is direct federal-to-local transfer of federally developed software. Examples are the geocoding applications (GBF/DIME) of the Census Bureau, the Uniform Fire Incidence Reporting System of HUD, and the Job Bank systems of the Department of Labor.⁶¹ The second kind of transfer involves search, evaluation, selection, and packaging of the better existing operational computer applications to encourage transfer to other local governments. Examples are the Urban Technology projects of the National Science Foundation (NSF).⁶² The third kind of transfer involves establishing centers to facilitate inter-governmental transfer of applications. Such a software "clearinghouse" is now being planned under the auspices of HUD and NSF.⁶³
4. *Education and Training.* Some federal agencies sponsor the development and writing of instructional materials for training local government management in EDP, and occasionally they provide support for seminars and training conferences. Instructional materials development is now being supported by NSF and HUD through Public Technology, Incorporated and through seminars being planned at the University of Georgia with support from HEW.
5. *Research Support.* This is more indirect assistance, since

most research is done through universities. Among the recent examples of support for applied research are the NSF-sponsored EPRIS (Evaluation of Policy-Related Research in Municipal Information Systems) Project and the URBIS (Urban Information Systems) Research Project, both conducted at the Public Policy Research Organization (PPRO) of the University of California, Irvine. These research projects are intended to provide findings to assist the development of instructional materials and the planning of federal policies for local government EDP assistance.

Impacts of Federal Assistance

As might be expected, the fragmented nature of federal assistance for local government information systems has had fragmented impacts on local government EDP. The most general impact of federal project assistance has been to stimulate EDP development. Those local governments with federal project support tend to have more EDP applications than other governments with comparable characteristics. This stimulated development seems to be primarily a function of the increased money available for EDP. Local governments appear to add federal financial support to their own efforts, rather than to substitute it for local expenditures.⁶⁴

Of the various kinds of programs that have been tried, the greatest long-term impact seems to come from programs that provide direct monetary and technical support to develop applications in a specific functional area. Examples of these programs are the geographic base file system projects of the Census Bureau and the police assistance systems of the LEAA, both of

which are being used in an increasing number of local governments. Projects to assist in development of computer aids for planning, such as HUD's 701 Planning and Management Information Systems efforts, have had less impact, perhaps because the support has been sporadic and diffuse.

The most ambitious federally-funded projects have had the most questionable impacts. This is particularly true of the major demonstration projects, including the USAC Program. These projects have been very costly (the USAC Program cost over \$26 million), and by their nature, have directly affected the fewest local governments of any assistance programs. USAC, for example, involved only two cities on a full scale and four others on a partial scale. These projects have produced useful results, particularly in the sense that they have helped demonstrate those aspects of local government operations where the technology has its greatest and least promise. A major shortcoming of these programs, particularly the USAC program, is a lack of federal follow-through. Local governments are still waiting for results from the USAC Program; but the federal government has not yet developed an approach for distilling and disseminating those results.

Suggestions about the Federal Role

Given the project-oriented approach of federal assistance to local government EDP, the federal programs must be viewed as experiments. These experiences indicate the federal government should concentrate its assistance efforts in four places. First, the federal government should make a serious commitment to study the outcomes of the projects it has previously funded. This could provide local governments with an understanding of the successes and failures of these different attempts to use the technology, and could provide federal agencies with insights for improving these assistance pro-

grams. This effort should include a commitment to further research into the use of EDP by local governments.

Second, the federal government should continue to support initial development efforts for particular EDP applications in functional areas such as police, fire, health, welfare and management. These programs might be of the LEAA grant-in-aid variety, or of the Census Bureau software transfer and implementation variety.

Third, the federal government should provide an educational and training capability that aims to assist local governments in improving their understanding and use of EDP. This should include support for development of training materials that address both the problems and potential of EDP from an unbiased perspective.

Finally, the federal government should facilitate the sharing of experiences and approaches to EDP among local governments. This might be accomplished by providing mechanisms for information exchange and by sponsoring regional seminars and conferences for local government management.

CONCLUSION

This essay has attempted to provide a broad perspective on the experience of city and county governments in the United States with information technology. Given the extremely rapid rate of change in EDP use by American local governments, a summarization of the current state of development in the technology seems the most appropriate "conclusion."

Virtually all of the larger city and county governments in the United States now use computers. Within another decade, all but the very smallest local governments will have adopted the technology. Despite widespread use of EDP, there is currently a substantial amount of variation between local

governments in the extent to which their activities are computerized, in the sophistication of hardware and software employed, and in the organizational arrangements for controlling EDP.

Most current computer applications in local government are for the routine, operational tasks. Yet it has often been difficult to specify clearly the impacts of these EDP uses on local government activities. Computers seem to have increased the speed and ease of operations on many tasks, to have reduced cost and/or staff on some routine applications, and to have provided useful information to managers. But many of the expected benefits from applying information technology to the functions of local government are either unclear or unrealized.

The current state of development of information technology in local government should be viewed pragmatically, and not in relation to past predictions about how the technology would spread and impact local governments. From this perspective it appears that local governments have usually exercised good judgment in the adoption and application of computer technology. They have developed EDP capability on their own, primarily in applications serving basic operations. It seems likely that as new and more helpful uses for the technology are developed, local governments will adopt them at a steady rate.

The data indicate that the technology is being developed in a predictable pattern with regard to its diffusion among local governments, movement towards independent EDP departments, and emphasis on operations-oriented applications. Nevertheless, a theme underlying this examination of local government EDP, particularly with reference to both the local and federal government roles, is that development of the technology has been relatively

uncontrolled. To further capitalize on benefits of the technology, government personnel with policymaking and management responsibilities most actively guide the use and expansion of information technology. Among other things, this involves continuous monitoring and control of the EDP operation by major appointed and elected officials.

A few projections can be made about the use of EDP in U.S. local governments over the next decade. There will be continued extension and development of automated applications in the routine, internal operations of the government. Computer uses which facilitate management control and planning will also expand substantially. Moreover, there will be a continuing stream of experiments in which individual local governments attempt to apply sophisticated aspects of computer technology to a particular function. In addition to this relatively uncoordinated activity, mechanisms will be established to facilitate the inter-governmental transfer of applications software.

Given a continuing fast pace of development of information technology, it is reasonable to forecast that EDP will be a significant transformer of the local government operation. Such development includes both the fuller mastery of existing technology over time and also the introduction of newer aspects of the technology, including mini-computers, micro-computers, cable communications networks, and data base management systems. At very least, the technology will continue to be a major source of instability for many established modes of operation in the government. In those local governments which are most innovative and ambitious in their use of information technology, one can predict a fascinating clash between the transforming capacities of the technology and the conservatizing tendencies of local government or-

ganization and personnel. More broadly, we speculate that these technologies have the potential to alter and intensify the local government--citizen interface through innovative applications that provide direct service or information to citizens. Given the history of technological innovations, it is likely that the new technology of information sciences and EDP will prevail in the end, and that local governments will gradually adapt to its influence.

NOTES

*Authors' Note: Authors are listed randomly to denote equal contribution. The findings and conclusions presented here are the opinions of the authors and other members of the Urban Information Systems Research Group (URBIS), particularly William H. Dutton, Rob Kling, Joseph Matthews, Alex Mood, and Alana Northrop. We also acknowledge the helpful comments from Sheila Grattan and David Schetter of the PPRO professional staff.

1. "Information technology" is used broadly here to include computers, telecommunications, and management science techniques, as in: Meyers, C. A. (Ed.) The impact of computers on management. Cambridge, MA.: The MIT Press, 1967; Oettinger, A. G. Communications in the national decision-making process. In Greenberger, Martin (Ed.) Computers, Communications and the public interest. Baltimore: Johns Hopkins University Press, 1971.
2. The use of information technology in local governments in the OECD member nations is documented in the OECD Informatics Studies publications, particularly numbers 1, 7, and 8.
3. The countries and local governments participating in the Panel's study are Austria (Vienna); Canada (Calgary); Denmark (Aarhus, Vaerlørse); Finland (Helsinki); France (Montpellier, Toulouse, Gagny); Germany (Duisburg, Backnang, Nürtingen); Japan (Maebashi City, Nichinomiya City); Sweden (Jönköping); United Kingdom (Leeds, Torbay).

4. At this date, the census survey work of URBIS is nearing completion and the in-depth, forty-city case work survey is being organized. More complete discussion of the URBIS Project can be found in Kraemer, K. L. and King, J. L., The URBIS project: A policy-oriented study of computing in local government. Computers and productivity in local government: Papers from the Twelfth Annual Conference of URISA. Washington, D.C.: The Urban and Regional Information Systems Association, 1976; and Kraemer, K. L., Danziger, J. N., Dutton, W. H., and Mood, A. M., with Kling, Rob. A future cities survey design for policy analysis. Socio-Economic Planning Sciences (forthcoming, 1976).
5. This arrangement was formulated at the Computer Utilization Group meeting of April 1975 and through informal, cooperative arrangements agreed on by the OECD Panel and the Public Policy Research Organization.
6. The majority of research findings presented here can be found in other documents from the URBIS Project and other PPRO projects in information technology. Most of the relevant works are cited in subsequent footnotes as various findings are presented in the text.
7. Kraemer, K. L. The evolution of the information systems in urban administration. Public Administration Review, 1969, 29, 389-402; Kraemer, K. L. Information in urban systems. The International Review of Administrative Sciences, 1974, 40(2), 3-15; and Kraemer, K. L. and King, J. L. Computers and local government: Manager's guide. Lexington, Mass.: Lexington Books (forthcoming, 1976).

8. Kraemer, K. L., Dutton, W. H. and Matthews, J. R. Municipal computers: Growth, usage and management. (Urban Data Service Report, Vol. 7, No. 11) Washington, D.C.: International City Management Association, 1975; and Matthews, J. R., Dutton, W. H. and Kraemer, K. L. County computers: Growth, usage and management. (Urban Data Service Report) Washington, D.C.: International City Management Association, 1976.
9. Danziger, J. N. and Dutton, W. H. Technological innovation in local government: The case of computing. (Working Paper No. 76-12) Irvine, CA.: University of California, Public Policy Research Organization, 1976.
10. Kraemer, Dutton and Matthews, op. cit.; Matthews, Dutton and Kraemer, op. cit.
11. Ibid.
12. Schrems, E. and Duggar, G. Information systems procurement, computer resource allocation, and finance policy. In Kraemer, K. L. and King, J. L. (Eds.) Computers and local government: A review of research. Lexington, Mass.: Lexington Books (forthcoming, 1976).
13. Kraemer, Dutton and Matthews, op. cit.; Matthews, Dutton and Kraemer, op. cit.
14. Sartore, A. B. and Kraemer, K. L. Automation, work and manpower policy. Vol. VI. Irvine, CA.: University of California, Public Policy Research Organization, 1974 (NTIS No. PB 245692); and Matthews, J. R.

- Information functions, services and administrative policy. In Kraemer, K. L. and King, J. L. (Eds.) Computers and local government: A review of research, op. cit.; Kraemer, K. L. and King, J. L. Computers, power and urban management: What every local executive should know. Beverly Hills, CA.: Sage Publications (forthcoming, 1976); and Danziger, J. N. Service provider or skill bureaucracy?: The data processing function from a data processing perspective. Proceedings of the Symposium on Information Technology and Urban Governance. Ministry of State for Urban Affairs, Ottawa, Canada, February 24-26, 1976.
15. Kraemer, Dutton and Matthews, op. cit. and Matthews, Dutton and Kraemer, op. cit.
 16. The smaller local governments exhibit considerably less instability than the larger governments. See Ibid.
 17. Ibid.
 18. One estimate places the total cost of information handling at 25 percent of state and local government expenditures. State of California information system study: City-state information flow. Sunnyvale, CA.: Lockheed Missiles and Space Company, 1965.
 19. Kraemer, Dutton, and Matthews, op. cit. and Matthews Dutton, Kraemer, op. cit.
 20. This system of classifying information processing tasks is described in Danziger, J. N. Computers, local government and the litany to EDP. Public Administration Review (forthcoming, 1976), and Ibid.

21. Considerably more detail on current and planned computer applications in U.S. cities and counties is contained in Kraemer, Dutton, and Matthews, op. cit. and Matthews, Dutton and Kraemer, op. cit.
22. Applications designed to serve citizens directly are reported in the professional and commercial literature, but their actual incidence is very low. In addition, field research done in the URBIS Project revealed that even these widely-publicized service applications might suffer from serious shortcomings. See Kling, R. The Riverville social services information and referral system (Working Paper No. 75-02). Irvine, CA.: University of California, Public Policy Research Organization, 1975.
23. Kraemer, Dutton and Matthews, op. cit. and Matthews, Dutton and Kraemer, op. cit.
24. Those applications which do exist are highly experimental and usually involve other information technologies, such as two-way cable communications, wherein the computer technology might be a small part of the total application.
25. The goal of Phase II of the URBIS Project is to obtain clear and objective measures of the computer's impact.
26. Chief executives include city managers, mayors, county administrative officers and county board chairmen. Complete discussion of the chief executives' views is presented in Nation's Cities, 1975, 13(10), 17-40. Articles in that report are referenced below as they are discussed in the text of this paper.

27. Danziger, J. N. EDP's diverse impacts on local governments. Nation's Cities, Ibid, 24-27.
28. Danziger, op. cit.
29. Sartore and Kraemer, op. cit. and Danziger, op. cit.
30. Danziger, Computers, local governments and the litany to EDP, op. cit.
31. Danziger, EDP's diverse impacts on local governments, op. cit. and Kraemer, K. L. and Pearson, S. Chief executives say they're sold on EDP, Nation's Cities, op. cit., 20-23.
32. See Sartore and Kraemer, op. cit. for discussion on the predicted and actual impacts of computers on integration of staff in business and government organizations.
33. Ibid. See also Downs, A. A realistic look at the final payoffs from urban data systems. Public Administration Review, 1967, 27(3), 204-210.
34. Kling, op. cit.
35. Dutton, W. H. and Kraemer, K. L. Computers and management control in local governments (Working Paper No. 76-13). Irvine, CA.: University of California, Public Policy Research Organization (forthcoming, 1976).
36. The experiments with urban model building are discussed in the context of urban information systems in Kraemer, The evolution of information systems in urban administration, op. cit.

35. Dutton, W. H. and Kraemer, K. L. Computers and management control in local governments (Working Paper No. 76-13). Irvine, CA.: University of California, Public Policy Research Organization (forthcoming, 1976).
36. The experiments with urban model building are discussed in the context of urban information systems in Kraemer, op. cit.
37. The extent of use of urban models by U.S. planning organizations is reported in Pack, J. R. The use of models: Report on a survey of planning organizations. Journal of the American Institute of Planners, 1975, 41, 191-197. An excellent critique of urban models is contained in Brewer, G. Politicians, bureaucrats and the consultant: A critique of urban problem solving. New York: Basic Books, 1973, and Lee, D. B., Jr., Requiem for large scale models. Journal of the American Institute of Planners, 1973, 39, 163-178.
38. Danziger, J. N. Evaluating computers: More sophisticated EDP uses. Nation's Cities, op. cit., 31-32.
39. For a review of research on privacy and security issues in the U.S., see Mossman, F. I. and King, J. L. Disclosure, privacy and information policy. In Kraemer, K. L. and King, J. L. (Eds.) Computers and local government: A review of research, op. cit.
40. Dutton, W. H. Major policy concerns facing local executives. Nation's Cities, op. cit., 33-36.
41. Ibid.

42. The manager's role in EDP development and operation is discussed in Kraemer and King, Computers and local government: Manager's guide, op. cit.
43. Kraemer, K. L. Who really is in charge of decisions about EDP? Nation's Cities, op. cit., 37-40.
44. Danziger, Service provider or skill bureaucracy?, op. cit.; and, Lowi, T. Machine politics--old and new. The Public Interest, 1967, 83-92.
45. Kraemer and King, Computers, power and urban management, op. cit.
46. This idea was first articulated by Rob Kling and is being explored in a working paper: Kling, R. and Kraemer, K. L. User involvement and problems of computer management. Irvine, CA.: University of California, Public Policy Research Organization (forthcoming, 1976).
47. Kraemer and King, Computers, power and urban management, op. cit.
48. A review of the research on cost-benefit analysis and its application to EDP is contained in Schrems and Duggar, op. cit.; problems in applying cost-benefit analysis to local government EDP are discussed in King, J. L. Cost-benefit analysis: A problematic exercise in local government computing. In Computers and productivity in local government: Proceedings of the Twelfth Annual Conference of URISA. Washington, D.C.: Urban and Regional Information Systems Association, 1976.
49. Kraemer, K. L. Local government, information systems and technology transfer in the U.S.: Evaluating some common beliefs about transfer

of computer applications. Proceedings of the Symposium on Information Technology and Urban Governance, Ministry of State for Urban Affairs, Ottawa, Canada, February 24-26, 1976.

50. These are elaborated in Kraemer, op. cit., and Danziger, Computers, local governments and the litany to EDP, op. cit.
51. Dutton, op. cit.
52. Davis, R. M. Federal interest in computer utilization by state and local governments. The Bureaucrat, 1972, 1(4), 349-356.
53. U. S. Department of Labor, Bureau of Labor Statistics. Adjustments to the introduction of office automation (1960); Impact of office automation in the internal revenue service (1963); and Impact of office automation in the insurance industry (1966). Washington, D.C.: Government Printing Office; and U.S. National Commission on Technology, Automation, and Economic Progress, Technology and the American economy, and Appendix Volumes I-VI. Washington, D.C.: Government Printing Office, 1966.
54. See for example: The President's Commission on Federal Statistics, Federal statistics. Report of the President's Commission (2 vols.). Washington, D.C.: Government Printing Office, 1971.
55. Intergovernmental Task Force on Information Systems, The dynamics of information flow. Washington, D.C.: The Task Force, 1968.
56. U.S. National Aeronautics and Space Administration. Space, science and urban life. Washington, D.C.: Government Printing Office, 1963;

Denver Research Institute, Defense systems resources in the civil sector: An evolving approach, an uncertain market. Washington, D.C.: Government Printing Office, 1967; U.S. Congress, Senate, Committee on Labor and Public Welfare, Subcommittee on the Utilization of Scientific Manpower. Scientific manpower utilization, 1965-1966, and Scientific manpower utilization, 1967. Washington, D.C.: Government Printing Office, 1967.

57. Ten federal departments and agencies joined to create a program for research and development on computer-based information systems for local government under USAC--the Urban Information Systems Inter-Agency Committee. USAC's basic purposes, structure and functioning are discussed in Kraemer, K. L. USAC: An evolving intergovernmental mechanism for urban information systems development. Public Administration Review, 1971, 31(5), 543-551. An evaluation of USAC is contained in Urban Information Systems Inter-Agency Committee (USAC) Support Panel, Assembly of Engineering, National Research Council. Local government information systems--a study of USAC and the future application of computer technology. Washington, D.C.: National Research Council (forthcoming, 1976).
58. Davis, op. cit.
59. Two reports which discuss the experience of these projects are: Tulsa Metropolitan Area Planning Commission. Metropolitan data center project. Tulsa, OK.: Metropolitan Data Center, 1966; Kling, op. cit.

60. The experience with such systems is discussed from the state and local viewpoint in Dial, O. E. (Forum Ed.) Computers: To dedicate or not to dedicate, that is the question. The Bureaucrat, 1972, 1(4), 305-378.
61. ~~An evaluation of the Department of Labor's job bank program is contained~~ in Ullman, J. C. and Huber, G. P. The local job bank program. Lexington, MA.: Lexington Books, 1973.
62. National Science Foundation, Division of Advanced Productivity Research and Technology. Program solicitation: Decision-related research in the field of urban technology. Washington, D.C.: National Science Foundation, Research Applied to National Needs, 1976.
63. USAC Support Panel, op. cit.
64. Danziger and Dutton, op. cit.

END
DATE
FILMED
8-17-76
NTIS

COASTAL ZONE
INFORMATION CENTER

